

SECTION 15180

HYDRONIC PIPING

LANL MASTER CONSTRUCTION SPECIFICATION

When editing to suit project, author shall add job-specific requirements and delete only those portions that in no way apply to the activity (e.g., a component that does not apply). To seek a variance from applicable requirements, contact the LEM Mechanical POC.

When assembling a specification package, include applicable specifications from all Divisions, especially Division 1, General Requirements.

Delete information within “stars” during editing.

Specification developed for ML-3 projects. For ML-1 / ML-2, additional requirements and QA reviews are required.

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Site and building pipe materials, fittings, valves, and accessories for heating water, chilled water, tower water, equipment drains, and overflow piping.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01330, Submittal Procedures:
 - 1. Catalog data on pipe materials, fittings, valves, and accessories.
 - 2. Installation instructions for valves and accessories.
 - 3. Certifications of welders.

1.3 QUALITY ASSURANCE

- A. Comply with ASME B31.9, Building Services Piping.

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

- A. Refer to Section 01630, Product Options and Substitutions.

2.2 HEATING WATER PIPING, BURIED (SERVICE UP TO 250 DEGREES F)

- A. Copper Tubing: ASTM B88, Type K, hard drawn or annealed.
 - 1. Fittings: ASME B16.22, wrought copper and copper alloy, solder joint.
 - 2. Joints: AWS A5.8 BCuP silver braze.
 - 3. Coating: See Part 3, Corrosion Control.
- B. Pipe: Black steel, ASTM A53, standard wall.
 - 1. Fittings: Black steel, ASTM A234, butt-welded type, standard wall.
 - 2. Joints: Welded.
 - 3. Coating: See Part 3, Corrosion Control.

2.3 HEATING WATER PIPING, ABOVE GROUND (SERVICE UP TO 250 DEGREES F)

- A. Copper Tubing: ASTM B88, Type K, hard drawn or annealed.
 - 1. Fittings: ASME B16.22, wrought copper and copper alloy, solder joint.
 - 2. Joints: Solder, ASTM B32, Grade 95TA.
- B. Pipe: Black steel, ASTM A53, standard wall.
 - 1. Fittings: Black steel, ASTM A234, butt welding type or malleable threaded type, ASME B16.3.
 - 2. Joints: Welded for pipe sizes over 2 1/2 inches and above, threaded for pipe sizes up to 2 inches.

2.4 CHILLED WATER PIPING, BURIED

- A. Copper Tubing: ASTM B88, Type K, hard drawn or annealed.
 - 1. Fittings: ASME B16.22, wrought copper and copper alloy, solder joint.
 - 2. Joints: AWS A5.8 BCuP silver braze.
- B. Pipe: Black steel, ASTM A53, standard wall.
 - 1. Fittings: Black steel, ASTM A234, butt-welded type, standard wall.
 - 2. Joints: Welded.

3. Coating: See Part 3, Corrosion Control.

C. Ductile Iron Pipe: AWWA C151.

1. Fittings: AWWA C110, ductile or gray iron. AWWA C153 compact fittings are not acceptable.
2. Joints: AWWA C1111, bell and spigot with rubber gaskets.
3. Coating: Pipe and fitting, cement mortar-lined with bituminous outside coating.
4. PVC Pipe: ASTM D1785, schedule [40][80].
5. Fittings: PVC, ASTM D2466 (schedule 40), or ASTM D2467 (schedule 80).
 - a. Joints: ASTM D2855, solvent weld.

2.5 CHILLED WATER PIPING, ABOVE GRADE

Specify Type K when design exceeds pressure and temperature ratings of Type L

A. Copper Tubing: ASTM B88, Type L, hard drawn or annealed.

1. Fittings: ASME B16.22, wrought copper and copper alloy, solder joint.
2. Joints: Solder, ASTM B32, Grade 95TA.

B. Pipe: Black steel, ASTM A53, standard wall.

1. Fittings: Black steel, ASTM A234, butt welded type, standard wall or malleable threaded type, ASME B16.3.
2. Joints: Welded for pipe sizes 2 1/2 inches. and above, threaded for pipe sizes up to 2 inches.

C. Pipe: Black steel, ASTM A53, standard wall, grooved for Victaulic fittings and couplings.

1. Fittings: Victaulic, ductile or malleable iron, service rating 35 degrees F to 230 degrees F at 300 psig working pressure. Use long radius elbows (1 1/2 D) and flexible couplings.

2.6 TOWER WATER PIPING, BURIED

A. Copper Tubing: ASTM B88, Type K, hard drawn or annealed.

1. Fittings: ASME B16.22, wrought copper and copper alloy, solder joint.

2. Joints: AWS A5.8 BCuP silver braze.
- B. Pipe: Black steel, ASTM A53, standard wall.
1. Fittings: Black steel, ASTM A234, butt-welded type, standard wall.
 2. Joints: Welded.
 3. Coating: See Part 3, Corrosion Control.
- C. Ductile Iron Pipe: AWWA C151.
1. Fittings: AWWA C110, ductile or gray iron. AWWA C153 compact fittings are not acceptable.
 2. Joints: AWWA C1111, bell and spigot with rubber gaskets.
 3. Coating: Pipe and fitting, cement mortar-lined with bituminous outside coating.
 4. PVC Pipe: ASTM D1785, schedule [40][80].
 - a. Fittings: PVC, ASTM D2466 (schedule 40), or ASTM D2467 (schedule 80).
 - b. Joints: ASTM D2855, solvent weld.

2.7 TOWER WATER PIPING, ABOVE GRADE

 Specify Type K when design exceeds pressure and temperature ratings of Type L

- A. Copper Tubing: ASTM B88, Type L, hard drawn or annealed.
1. Fittings: ASME B16.22, wrought copper and copper alloy, solder joint.
 2. Joints: Solder, ASTM B23, Grade 95TA.
- B. Pipe: Black steel, ASTM A53, standard wall.
1. Fittings: Black steel, ASTM A234, butt welded type, standard wall or malleable threaded type, ASME B16.3.
 2. Joints: Welded for pipe size 2 1/2 in. and above, threaded for pipe sizes up to 2 in.
- C. Pipe: Black steel, ASTM A53, standard wall, grooved for Victaulic fittings and couplings.
1. Fittings: Victaulic, ductile or malleable iron, service rating 35 degrees F to 230 degrees F at 300 psig working pressure. Use long radius elbows (1 1/2 D) and flexible couplings.

2.8 EQUIPMENT DRAINS AND OVERFLOWS

- A. Pipe: Galvanized steel, ASTM A53, standard wall.
 - 1. Fittings: Galvanized cast iron, or ASTM B16.3 malleable iron.
 - 2. Joints: Threaded or grooved mechanical couplings.
- B. Copper Tubing: ASTM B88, Type K, hard drawn.
 - 1. Fittings: ASTM B16.22, wrought copper and copper alloy, solder joint.
 - 2. Joints: Solder, ASTM B32, Grade 95TA.

2.9 UNIONS, FLANGES, AND COUPLINGS

- A. Unions for pipe 2 inches and under.
 - 1. Copper Tubing: ASME B16.22, Class 150, wrought copper, solder joint.
 - 2. Ferrous Piping: ASME B16.39, Class 150, malleable iron treaded.
- B. Flanges for pipe over 2 inches.
 - 1. Copper Tubing: ASME B16.5, Class 150, bronze.
 - 2. Ferrous Piping: Forged Steel, ASME B16.5, Class 150.
 - 3. Gaskets: 1/16 inch thick preformed neoprene.
- C. Mechanical Couplings.
 - 1. Vitaulic, ductile or malleable, service rating 35 degrees F to 230 degrees F at 300 psig, flexible type.
- D. Dielectric Connections.
 - 1. Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier.

2.10 VALVES

- A. Gates Valves up to 2 inches.
 - 1. Manufacturer: Nibco, Series 111.
 - 2. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, hand wheel, inside screw, solid wedge disc, solder or threaded ends.

- B. Gate Valves over 2 inches.
 - 1. Manufacturer: Nibco, Series 617-0.
 - 2. MSS SP-70, Class 150, iron body, bronze trim, outside screw and yoke, hand wheel solid wedge disc, flanged ends.
- C. Globe Valves up to 2 inches.
 - 1. Manufacturer: Nibco, Series 211.
 - 2. MSS SP-80, Class 150 bronze body, bronze trim, hand wheel, bronze disc, solder or threaded ends.
- D. Globe Valves over 2 inches.
 - 1. Manufacturer: Nibco F-7188.
 - 2. MSS SP-85, Class 125, iron body, bronze trim, hand wheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends.
- E. Ball Valves up to 2 inches.
 - 1. Manufacturer: Nibco, Series 585-70.
 - 2. MSS SP-110, 600 psi non-shock cold water, bronze, two piece body, chrome plated brass ball, full port, teflon seats and stuffing box ring, blowout proof stem, lever handle, solder or threaded ends.
- F. Butterfly Valves over 2 inches.
 - 1. Manufacturer: Nibco, Series LD 2000.
 - 2. MSS SP-67, 200 psi non-shock cold water, ductile iron body, aluminum bronze disc, resilient replaceable EPDM seat, lug style, extended neck, lever handle, for use between Class 125/150 flanges.
- G. Plug Valves.
 - 1. Tapered plug valve, class 125, bronze or iron body, water service, square head or tee handle, with female NPT threaded or flanged ends to suit piping
- H. Grooved Valves.
 - 1. Manufacturer: Victaulic

Specify grooved valves (ball, butterfly, and check) when using grooved piping system
(mechanical joints.)

2.11 SWING CHECK VALVES

- A. Sizes up to 2 inches.
 - 1. Manufacturer: Nibco 433 Series.
 - 2. MSS SP-80, Class 150 bronze, horizontal swing, y-pattern, renewable seat and disc. Solder or threaded ends to suit piping.
- B. Sizes over 2 inches.
 - 1. Manufacturer: Nibco F-918.
 - 2. MSS SP-80, Class 125 iron body, fluid to 450 degrees F, bolted bonnet, horizontal swing, renewable seat and disc, flanged.

2.12 SILENT CHECK VALVES

- A. Sizes up to 2 inches.
 - 1. Manufacturer: Nibco 480 Series.
 - 2. Class 125 bronze, in-line left type, spring actuated, TFE seat and disc, solder or threaded ends to suit piping.
- B. Sizes over 2 inches.
 - 1. Manufacturer: Nibco F-910.
 - 2. Class 125, iron body, fluid to 200 degrees F, renewable seats and disc, spring actuated, flanged.

2.13 BALANCING VALVES

Refer to LANL Standard Drawings, [ST6121](#), Chilled/Hot Water Coils.

- A. Manufacturer: Bell and Gossett, Circuit Setter Model CB.
- B. Bronze body, brass ball construction with differential read out ports and drain/purge ports, 300 psig rating at 250 degrees F, with memory stop features and calibrated nameplate.
- C. Size [] inches., NPT threaded ends.

2.14 PRESSURE GAUGES

Refer to manufacturer's recommendation for gauge pressure range. Generally, a pressure range of twice the working pressure is recommended with maximum working pressure not exceeding 75 percent of the range. If pulsation occurs, working pressure should not exceed 65 percent of the pressure range.

- A. Manufacturer: Reotemp Instruments.
- B. ANSI B40.1, 1 percent full scale accuracy, minimum 4 inch dial, glycerin filled, phosphor bronze bourdon tube, 1/4 inch NPT brass bottom connection, steel or phenolic case. Furnish with ball valve.

- 1. Range: [] psi or [See Drawings]

2.15 THERMOMETER

Select range that will locate the operating temperature within the upper 2/3 of the dial range

- A. Manufacturer: Reotemp G45UR.
- B. Gas actuated, mercury free, 4 1/2 inches phenolic case, all angle direct mount, 1 percent full-scale accuracy, with standard well, insert length to suit piping.

- 1. Range: [] degrees F or [See Drawing].

2.16 STRAINERS

- A. Sizes up to 2 inches.
 - 1. Manufacturer: Watts Series 777.
 - 2. Bronze body, Y-type, screwed ends, 20 mesh stainless steel screen, for water service-WOG (non-shock) 400 psi at 210 degrees F.
- B. Sizes above 2 inches.
 - 1. Manufacturer: Watts Series 77F-D.
 - 2. Class 125, cast iron body, Y-type, B16.1, flanged ends, stainless steel standard screen, for water service-WOG (non-shock) 200 psi at 150 degrees F.

2.17 TEST PLUGS (PETE'S PLUG)

- A. 1/4 inch NPT, brass body, neoprene core, 1000 psig rating, complete with sealing cap and gasket, to receive 1/8 in. OD probe.

2.18 RELIEF VALVE

- A. Manufacturer: Kunkle, Model 912.
- B. Bronze body, brass trim, ASME Section VIII (UV) rated for liquid service, maximum pressure and temperature rating 300 psig and 406 degree F;
 - 1. Size: 1/2 inch inlet, 3/4 inch outlet.
 - 2. Set Pressure: [] psi.
 - 3. Orifice: [] dia.
 - 4. Capacity: [] gpm.

2.19 EXPANSION TANK

ASME coded tanks required on steam/hot water boiler systems exceeding 30 psig.

- A. Manufacturer: Amtrol, Model [AX-] ASME coded.
- B. Manufacturer: Amtrol, Model [SX-] Non-ASME coded.
- C. Vertical flow mount tank with removable and replaceable butyl rubber bladder, steel shell, rated for 125 psig and 240 degree F and factory precharged to 12 psig. Optional features: [seismic mounted clips].
 - 1. Tank & Acceptance Volume: [] gallons.

2.20 AIR VENT

- A. Manufacturer: Bell and Gossett, Model No. 87
- B. Automatic float type with overflow connection, brass, rated for 150 psi and 240 degrees F.

2.21 PRESSURE REDUCING VALVE

- A. Manufacturer: Bell and Gossett, Model [].
- B. Brass body, factory setting 12 psig, adjustable range 10-25 psig, removable strainer, low inlet pressure check valve.

2.22 SOLENOID VALVE (OPEN COOLING TOWER MAKE-UP WATER)

- A. Manufacturer: CLA-VAL, No. 136G-01A.
- B. Brass body, globe valve, slow opening, rated for continuous flow of 125 gpm at 20 fps.

C. Electrical characteristics: 120V, single phase, 60 Hz.

2.23 WATER METER (OPEN COOLING TOWER MAKE-UP WATER)

A. Manufacturer: Badger, No. RCDL-M120.

B. Doppler ultrasonic flow meter, noninvasive, digital display of rate (gpm) and total flow (gallons), 4-20 mA output signal, 120V, single phase, 20-foot standard cable length, accuracy within plus or minus 2 percent of full scale, NEMA 4X thermoplastic housing, for use on [] SCH 40 pipe, standard flow range 1-10 fps.

2.24 3-WAY MIXING VALVE

Specify required mixing valve for cooling & heating coils per standard mechanical drawing ST6121. Select and size valve per manufacturer's instructions

2.25 3-WAY DIVERTING VALVE

Specify a diverting valve in tower/chilled water piping per mechanical standard drawing ST6130 when required. Select and size valves per manufacturer's instructions.

2.26 EXPANSION/FLEXIBLE CONNECTORS

Specify expansion joints, pump connectors, flexible connectors, etc., to suit project.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not install underground piping when bedding is wet or frozen.
- B. Verify that excavations are to required grade.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.

3.3 BURIED PIPING

Tracer wire and test station(s) are required when specifying cast iron, ductile iron, and non-metallic piping. Comply with Civil Standard Drawing ST3009 for tracer wire/test station details and Civil Standard Drawing ST3211 for trenching detail.

- A. Provide earth cover, bedding, warning tape, [tracing wire and test station(s)] per Drawings and Section 02310, Grading, Excavating, and Trenching.

3.4 INSTALLATION

- A. Install heating water, chilled water, condenser water in conformance with ASME B31.9.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals. Matching of bronze fittings with steel or copper pipe does not require dielectrics.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom and neither interfere with use of space nor take more space than necessary.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide access where valves and other equipment are not exposed.
- H. Install valves with stems upright or horizontal, not inverted.
- I. Sleeve and caulk pipes penetrating exterior walls or interior bearing walls. Provide waterproof installation for exterior walls. Provide UL/FM approved through-penetration firestop system when penetrating fire rated barriers (i.e., walls, floors, etc).
- J. Pipe relief valves to nearest floor drain. Install a union in the piping after each relief valve.
- K. Slope water piping and provide drain valves at low points.
- L. Flush and chemically treat HVAC water piping systems in accordance with Section 15185.
- M. Pressure test piping system in accordance with Section 15992.
- N. Label piping system in accordance with Section 15075.
- O. Insulate piping system in accordance with Section 15080.
- P. Support piping system in accordance with Section 15060.
- Q. Provide automatic air vents in hydronic closed piping systems at high point. Provide isolation ball valve at inlet connection.
- R. Install chrome-plated steel escutcheons for insulated pipes at finished surfaces.

- S. Above Grade Piping: Unless otherwise noted, provide ball valves in piping 2 inches and smaller, butterfly valves in piping 2 1/2 inches and larger, and gate valves with standard male capped hose connection, for equipment and drain valves. Provide globe valves for throttling applications.

3.5 CORROSION CONTROL

Contact LANL's SSS Utilities Corrosion Specialist at 667-5270, for cathodic protection requirements when using black steel pipe below grade. NOTE: Factory pre-insulated piping systems (e.g., Perma Pipe, Multi Therm 500, (303) 751- 4100 or Rovanco Corp, (505) 344-7100, may be used as a replacement for corrosion control and/or field insulation.

- A. Cathodic Protection: Furnish and install cathodic protection system as noted on the Drawings.

- B. Pipe Coating (black steel pipe below grade).

Specify a field wrap pipe coating such as Polyken or a factory coating suitable for the operating temperature of the piping system. Field wrap joints and fittings.

END OF SECTION